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# **The Case of the Wellington Loop: An Illustration of a Two Sided Market Strategy in an Educational ICT Infrastructure Development.**

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## **Abstract**

*This paper describes the Wellington Loop Trust which has been formed to enable a number of Wellington secondary schools to access the Internet via high speed broadband using the Citylink fibre infrastructure. The current literature is used to describe the Loop can as a two-sided market model and to illustrate how this model can be used to determine appropriate pricing strategies.*

## **Keywords**

Two-sided markets, collaboration technology, economic theory.

## **INTRODUCTION**

This paper describes the Wellington Loop Trust which has been formed to enable a number of Wellington secondary schools to access the Internet via high speed broadband using the Citylink fibre infrastructure.

The current literature on information goods, two-sided markets and their implications for pricing strategies is reviewed along with some relevant literature on electronic communities and the use of technology in education.

This paper then uses the literature as a basis to describe the Loop can as a two-sided market model and to illustrate how this model can be used to determine appropriate pricing strategies..

## **THE WELLINGTON LOOP**

The Wellington Loop Trust (the Loop) was formed in 2007 by six inner city secondary schools in Wellington (Wellington College, Wellington Girls College, St Mary's College, Wellington East Girls College, Wellington High School and the Correspondence school) to set up a pilot project to provide high speed uncapped internet access and shared applications for its members. The Trust was initially funded by a grant from the Digital Strategy 2005 Community Partnerships Fund and by an 18 month sponsorship by Citylink to provide use of its fibre network. The grant was matched by the donation of 'in-kind' resources from the participating schools for the start-up period.

The participating schools expect that the access to the internet provided by the Loop will allow them to exploit new technology in their teaching practices, particularly the use of resource intensive applications such as streaming video and audio, video conferencing and Web 2.0 tools. They also believe the Loop will provide them with access to the wider educational resources available on advanced networks through a connection with KAREN (Kiwi Advanced Research and Education Network) and allow them to collaborate with other teachers to enhance the learning experiences for their students.

In addition, most schools have a need for applications such as identity management, web content management, email, web filtering, learning management and library catalogs – one objective of the Loop is to reduce overall costs to schools by providing common tools for these applications which are hosted and supported centrally.

The Loop members expect that participation in the Loop will cost no more for internet access and the common school applications than their previous arrangements. If the pilot implementation is successful, they expect that economies of scale obtained by bringing more schools into the Loop to share the fixed costs will reduce the total costs for each school.

There is a perception that the schools' current providers of Internet access have failed to provide a reliable, high speed and uncapped service and that this is limiting the schools' ability to make use of new technology.

The initial funding for the pilot covers the cost of setting up the applications and the network access costs; however each of the six schools has had to pay a one-off access fee to connect to Citylink's fibre network. At the end of the sponsorship period, the Loop will have to pay for its use of Citylink's fibre – this is expected to be a fixed price which does not vary with the number of schools participating.

The goal of the Loop is to have an established set of applications being used by the original members and to be able to demonstrate to potential members the benefits they will gain from participation in the Loop. Each school which joins the Loop will have to pay to connect to the physical network and it is expected they will pay a membership fee to cover the services used. There are a number of schools in the wider Wellington area who are interested in participating; however the greatest barrier to early entry is their inability to connect to the Citylink network, due to either the cost of connection or their distance from the existing network.

The Loop intends to run as a not-for-profit organization which generates revenue to cover the costs of maintaining and supporting the infrastructure required to host the shared applications, the network access, the license and support costs for the application software, training for users and future enhancements to the services offered. The Loop Trust believes that six schools does not provide sufficient scale to meet these costs without imposing too great a financial burden on the members and is therefore interested in attracting a number of other schools, both secondary and primary level, to participate. There is recognition that some schools may not wish to utilize all the services offered, and that the primary schools are not as well funded and therefore may not be able to meet the same level of costs. The schools that may participate in the Loop vary widely in the number of students on their rolls and there is a belief that charging for membership would be perceived as fair if it is done on a 'per student' basis.

The initial thinking of the participating schools is that the Loop will allow them to make use of the following types of opportunities:

- Collaboration within the users of the Loop using video conferencing, email, and shared digital resources,
- Access to other schools and resources via KAREN similar to that described in the 'e-mentoring in music' music case study on the KAREN website (refer <http://www.karen.net.nz/music-mentoring/>),
- Dedicated time for teachers to build guides for teaching materials available through the network which are then used by other teachers who do not have the time to filter the wide array of content available,
- Explore and access teaching material prepared by other groups such as the US K20 Initiative which makes available applications like SeaMaven, a web-based application designed to enable science students to engage in collaborative learning by providing them with access to a real-time observational network of oceanographic sensors (refer <http://k20.internet2.edu/projects/58> ).

## LITERATURE REVIEW

The widespread use of the Internet has changed the way business can be done and what products can be offered. This section looks at some of the current literature that defines in economic terms what is currently on offer via the Internet.

### Information goods

Information goods are defined in the literature as being any information that is delivered digitally. Information goods generally require high fixed costs to produce but have low marginal costs of reproduction (Shapiro & Varian, 1999).

Information goods have been further defined as: (Quah, 2003)

1. Non-rival – each use of the good does not impact on the value to others
2. infinitely expandable – large quantities can be made available for very low cost
3. initial discreteness – making the first copy incurs all the costs
4. aspatial – not limited by location, can be accessed from anywhere
5. recombinant – has emergent properties that may create new value in the future.

Demand for information goods is often affected by network effects, which arise when a user places more value on a good if many other people are also using it (Shapiro & Varian, 1999). Typical examples of network effects predate the internet, such as the adoption of telephones where the value of owning a telephone increased as more people adopted the new technology.

The high fixed cost and low marginal cost of information goods leads to discussions in the literature about how the economics for these goods differs from physical goods.

Pricing strategies proposed include bundling of information goods as this provides savings on production and transaction costs and may offer complementarities among the components of the bundle (Bakos & Brynjolfsson, 1999). Different bundles will have value for different segments of the market and it is possible to create an 'economy' or 'lite' bundle which is a subset of the full bundle. Although this may not be any less expensive to create than the full bundle, it does allow the seller to reach a group of consumers who would not pay for the full bundle and thereby increase overall profits.

This approach has also been described as 'versioning' (Varian & Kahin, 2000). While having two versions is common, it may be better to offer three versions: 'lite', enhanced and a medium option which will appeal to indecisive consumers. Varian names this 'Goldilocks' pricing.

In order to gain some economies of scale it is possible that a consortium, or club, of consumers can form to purchase a variety of information goods and make them available to club members as a bundle for a fixed price. This avoids the problem of collusion where multiple suppliers of information goods work together to offer a bundle of their products (Bakos & Brynjolfsson, 1999).

An information intermediary brings buyers and sellers together via the Internet and can offer services such as:

- aggregation of buyer demand and seller products
- providing trust between participants
- facilitating the market transactions
- matching buyers and sellers through listing products and allowing searching to find price information so that buyers and sellers can make an agreement.

By offering different combinations of services at different price levels, it may be possible to use a low-priced service to attract more participants and then allow the participants to self-select between the low price basic service and the higher price premium service (Bhargava & Choudhary, 2004).

### **Two-sided markets**

Two-sided markets extend the concept of network effects to include two or more distinct customer groups who need each other and a platform which provides these customers with a mechanism for getting together to create value that could not otherwise be created. In a two-sided market one customer group chooses a good which affects another customer group's choice. Two-sided markets require an interaction between both sides through the platform, and this interaction must be able to be clearly defined (Parker & Alstyne, 2005; Rochet & Tirole, 2006).

Successful two-sided markets represent a virtuous cycle where more demand from one customer group creates more demand from the other customer group (Eisenmann *et al.*, 2006). Eisenmann *et al* provide a clear description of a platform which "embodies an architecture – a design for products, services and infrastructure facilitating network users' interactions – plus a set of rules; that is, the protocols, rights and pricing terms that govern transactions" (page 5).

A good example of this is the use of the portable document format (PDF) which was created by Adobe who sell the software to create documents in this format and gives away the software to read documents in PDF format. This example illustrates a common industry practice of charging the content developers (who create PDF documents) and subsidizing the content consumers (who read the PDF documents) to encourage use of the platform (the PDF format). In this instance, Adobe is able to invest in the PDF reader software which it gives away because, as more users use the reader, there is an increased demand for the complementary writer software. The revenue from the writer software more than covers the investment cost of both products.

This pricing strategy, which discounts one product to a zero price, relies on the property of information goods which have low, or zero, marginal costs. The difficulty comes in choosing which side of the market to subsidise and which to charge, as the platform incurs costs from both sides of the market. The suggested approach is to subsidise the customer group which is most quality or price sensitive and, given that information goods have low or zero marginal cost, it is relatively cost-less to add additional users to this side of the market.

Another strategy is to find a “marquee” user to participate exclusively in the platform and thereby attract more participants from the other customer group (Eisenmann et al., 2006).

In a two-sided market there is an indirect network externality where each side of the market expects better results if there are a large number on the other side, but this can be seen as a chicken & egg situation. In order to attract buyers a platform needs to have a large number of sellers, however sellers are only willing to participate if the platform can offer a large number of buyers. This can lead to the pricing strategy, described in the Adobe example above, which results in subsidizing one side and recovering the loss from the other side (Caillaud & Jullien, 2003).

An online information intermediary can be described as offering ‘info-mediation’ and this can be described as a two-sided market, where the value of the services to each side of the market is the number of potential partners that can be reached on the other side of the market (Jullien, 2005).

The literature (Jullien, 2005; Rochet & Tirole, 2006) describes how a platform can finance its activities from a combination of:

1. Registration fees or membership charges, which may be different for consumers and producers in the market
2. Transaction fees or usage charges, however for this to be feasible it must be possible to monitor transactions
3. Advertising on the platform which may replace the need to charge either side of the market directly

Membership fees are more useful when it is difficult or impossible to monitor the transactions and hence it is not possible to charge a transaction fee.

Where there are multiple platforms available for one user group to choose from, this is known as multi-homing. This can have an adverse effect on a two-sided market as competition between the platforms can lead to lowering of the fees that a platform can charge. In addition, where there are options for multi-homing, consumers may move to an alternate platform if the first one fails to deliver the expected benefits (Jullien, 2005). Conversely, if buyers can choose between multiple platforms then the platforms may compete for their business by changing the pricing or products offered (Rochet & Tirole, 2006).

Competition between multiple platforms can lead to a ‘winner takes all’ result where only one platform can remain viable and attracts all the customers. Multi-homing is less likely to be attractive to the users if the homing costs are relatively high, there are positive, strong network effects gained from participating in the platform, and both sides of the market have no strong preference for special features. However, a successful platform can still be “enveloped” by another platform that enters the market and offers the same, or better, functionality at a lower price (Eisenmann et al., 2006).

### **Electronic Communities**

As the costs of communication decrease new communities can emerge which enable geographically separated people to locate and share resources. However due to limitations on people’s ability to process information (ie bounded rationality) and the ability to filter what is accessed, it is possible that this extra access to information can reinforce existing prejudices rather than expanding the knowledge of the individuals involved. This has been termed ‘cyber balkanisation’ (Van Alstyne & Brynjolfsson, 2005).

A contrasting view is that ‘Web 2.0 technologies’ which build communities through facilitating social networking and collaboration. These will be used increasingly in business and education as the underlying technology and high-speed access becomes more pervasive (Alexander, 2006; Brynjolfsson & McAfee, 2007).

### **Teaching opportunities using the Internet**

The Ministry of Education emphasizes the role of Information and Communication Technologies (ICT) in improving educational outcomes for 21<sup>st</sup> century learners. A Ministry report describes the Ministry’s view that schools are responsible for their ICT investment decisions in response to their own requirements and the Ministry’s new resourcing framework will support the schools in doing this (Ministry of Education, 2008).

In addition, the use of technology within the New Zealand curriculum is seen to contribute to the development of students educationally, personally, culturally, environmentally, and economically. The Ministry of Education states that “The aim of technology education is to enable students to achieve technological literacy through the development of: • technological knowledge and understanding; • technological capability; • understanding and awareness of the relationship between technology and society” (Ministry of Education, 2007).

Digital Natives is a term that has been used to describe the current generation of school children who have grown up with easy access to digital technology and whose learning methods are significantly different from older generations as a result. (Prensky, 2001)

Web 2.0 has been defined by many with the recurring theme of facilitating creativity, collaboration, and sharing between users as opposed to the original delivery of static information on web pages that characterised the earlier period of access to information via the Internet. Web 2.0 tools, such as audio and video conferencing, blogs, social book marking and Wikispaces, can assist teachers to work with their students to communicate and collaborate outside of their immediate school environs (Gooding, 2008).

## DEFINING THE LOOP USING THE CONCEPTS

In applying the concepts found in the literature, it is necessary to define the products which are available from the Loop and identify if they are information goods.

The key components offered by the Loop can be described as:

1. Access to the Wellington Loop dark fibre via Citylink's fibre infrastructure. Each school pays Citylink directly to connect to the fibre. For the initial set up period, access is provided by Citylink free of charge. At the end of the start-up period Citylink is expected to charge their normal rate for the access,
2. The private Loop infrastructure which provides the connectivity for the schools, the servers and storage for using the Loop's private applications, and provides access to the commodity internet (aka the World Wide Web) and to KAREN.

The Wellington Loop Trust deed (Chapman Tripp, 2007) defines one of the purposes of the Loop as "establishing, maintaining and promoting a **high speed fibre optic** learning network" (emphasis added by the author). With this definition, there is an assumption that the private loop infrastructure is one product made up of all the identified components – by restricting access to the Loop to schools with access to fibre and therefore a minimum of 100mb/s speed, the Loop is establishing an entry criteria that must be met by all potential participants.

From this description it can be seen that the Loop is providing infrastructure to be able to access the information goods – which are the tools and content provided within the provided infrastructure, via access to the commodity network and via access to advanced networks using KAREN. These tools include video and voice conferencing, learning management software, web content management software, a video repository, and an e-portfolio tool which allows students to store and access their digital artifacts.

These tools mostly match Quah's (2003) definition of information goods in that each use of them does not impact on the value to other users (non-rival); they can be made available to any number of users for very low cost (infinitely expandable); the initial set-up to provide the tools incurs most of the costs (initial discreteness); the tools can be accessed from any location which meets the access speed requirement (aspatial); the teachers are expecting there will be emergent properties still to be discovered as a result of the availability of the infrastructure (recombinant).

The literature defines network effects as being when a user places more value on a good if many other people are also using it. Each of the schools within the Loop has the ability to set up an independent infrastructure for their own use to provide their students and teachers with access to the internet. Some of the schools have already invested in making this available and have connected to Citylink for access to the internet via the high-speed fibre infrastructure. The initial member schools have identified network effects in participating in the Loop in two distinct areas:

- The schools view the collaboration opportunities as becoming more and more valuable to each school as the number of other schools they can collaborate with increases,
- The infrastructure costs and access charges of the Loop are largely fixed and with more schools participating in the Loop, the economies of scale will mean that each school pays less for their access.

The Wellington Loop can be described as an information intermediary or "info-mediary". Using the criteria for an info-mediary outlined by Bhargava & Choudhary (2004), the Loop is doing the following:

- Aggregating buyer demand and seller products by providing a standard set of products and tools for all participating schools to access
- Providing trust between participants – schools are very concerned about the safety of their students and this extends to their access to the Internet. The Loop provides filtering of content available via the

commodity internet and KAREN also filters content available through its advanced network. These provisions allow the schools to trust that their students will not be exposed to any inappropriate content.

- Facilitating the market transactions – in the Loop the market transactions are the ability to use the tools provided to create, access and share content. The infrastructure provided by the Loop ensures that all users use common tools and this removes any barriers to collaboration.

Jullien (2005) described how an info-mediary can be described as a two-sided market because the value to each side of the market is the number of potential partners that can be reached on the other side of the market. In order to describe the Loop as a two-sided market, it is necessary to describe the platform and the two sides of the market.

The platform provided by the Loop can be described in terms of Eisenmann et al's (2006) definition as the infrastructure the Loop provides – this includes the access to Citylink's fibre network, aggregated internet service provision for access to the commodity internet, the connection to KAREN and the common tools provided by the private infrastructure.

The platform can be defined to include the Citylink fibre however it is technically possible for potential participants to use a different provider to connect to the shared infrastructure; in this situation the Loop can set a minimum standard access speed that new members must be able to meet as a condition of membership. Citylink have advised the Loop that its fibre network is accessible to approximately 80 schools in the Wellington region - this means that the remaining 135 schools in the region would have to choose another provider. This can be seen as an example of multi-homing where each school can choose the network provider that can provide high speed access to their location. Potential providers, other than Citylink, include Telstra and Telecom. It should be noted that access to fibre networks is not available in all locations.

One side of the market is the students and teachers who make use of the provided applications in the course of their learning and teaching and who will access the Loop to create content (where content is used loosely to describe any digital artifact that can be created with the tool provided, such as video, text and data), store their content in e-portfolios, access and share content with others both within their own school, but more importantly with students and teachers from other participating schools, and use real-time video conferencing tools to collaborate with other users.

The other side of the market is the participating schools which are business organizations that must provide and fund a range of tools for use by their community. Schools are accustomed to paying for internet and software resources on a per-student basis and the Loop provides an alternative to establishing their own infrastructure to provide the required functionality.

One definition of a two-sided market (Parker & Alstyne, 2005; Rochet & Tirole, 2006) requires that the interaction between both sides through the platform should be able to be clearly defined. In the Loop, the reputation of the school is enhanced by the provision of high quality tools to its students which are used productively to enhance the student's learning. This reputation creates an attractive environment for new students and motivated teachers who wish to take advantage of the opportunities the school provides.

Eisenmann et al's (2006) strategy of using 'marquee' users to attract new users has relevance to the Loop, in that the initial group of participating schools represent one third of the secondary schools in the Wellington city area. By participating exclusively in the Loop, they give the Loop credibility that will be attractive to the primary schools which feed into these schools, and also to the remaining secondary schools in the area.

Jullien (2005) and others identified various methods that a two-sided market can use to create revenue to fund its activities. Applying this to the Loop, it can be shown that schools are accustomed to paying for internet and software resources on a per-student basis and so could be charged a membership fee for each student to access the Loop.

With the platform and users as described, transactions can take many forms and it is not feasible to monitor these. Therefore it would not be possible to charge users a transaction fee or apportion usage charges.

Generating revenue through advertising is possible but not supported by the Loop members as being appropriate for the student audience. However, seeking grants and sponsorship from government and commercial organizations and recognizing these contributions on the Web Portal would be considered appropriate.

A common feature of two-sided markets identified in the literature is that one side is subsidized to attract users (the subsidy side) and the other side pays to participate in the market (the money side). Eisenmann et al's (2006) suggest that the group which is most price sensitive is the one that should be subsidized. For the Loop, the students and teachers are clearly price sensitive and therefore should be the subsidy side as they will only use the tools provided by the Loop if it is offered without charge as part of their usual learning and teaching

activities. Requiring a usage payment directly from each student is likely to disadvantage students who are unable to pay and this inequity will not find favour with the teachers. The money side, then, is the school as a business organization which will pay a fee per student per period ( ie per year) for access to the Loop services and technology. It is interesting to note that the school will likely recover this cost from the students via the school fees charged to their parents.

The Goldilocks pricing model (Varian & Kahin, 2000), which suggests offering three product versions with the assumption that most consumers will choose the middle option, does not have an obvious application to the Loop as there is no clear way to provide three distinct products or product bundles.

The Loop does have competition from large telecommunications companies who offer similar services and access to the Internet. Telecom currently offers the SchoolZone product (refer <http://www.telecom.co.nz/schoolzone> ) which contains some of the same sort of tools the Loop is offering though it requires participants to use its ADSL network for connectivity. Telstra provides high speed internet access as well. Currently these providers are perceived by the Loop members to be unable to offer the same speed, flexibility and reliability offered by the Loop. However these are large companies with significant resources who could see an advantage in enveloping the Loop's platform by offering similar or better services at significantly lower prices – as schools have limited funding, some may prefer to pay less for these services than the Loop charges and accept that they will miss out on some of the opportunities the Loop offers.

The Loop aims to build a community of schools in the Wellington region and to connect, via KAREN, to other education communities in New Zealand and internationally. While taking into consideration the concerns of Van Alstyne and Brynjolfsson that increased connectivity can lead to less integration, the teachers believe that by sharing their resources, and consolidating their efforts to find and filter appropriate content, the technology opportunities offered by the Loop allow them to work with their students to enable them to become confident 21<sup>st</sup> century learners.

The teachers in the member schools firmly believe in the benefits of belonging to an interconnected community of schools. Denise Johnson of Wellington Girls College sees the Loop as “opening new channels of communication that will challenge the comfort zone of some teachers”. The teachers also refer to Prensky's Digital Natives and see the use of collaborative tools as a way to engage with the students using the technology the students have grown up with.

Some of the schools have already invested in some of the applications the Loop plans to provide, such as learning management and content management systems, and are looking forwards to the emergent benefits of the collaborative opportunities offered by the Loop. There are some of the initial member schools who have little existing investment in technology and these are looking to learn from the others about how to maximize their use of the applications.

## **ISSUES FACED BY THE LOOP**

The Loop has been provided with a finite amount of sponsorship and funding for the start-up and the first 18 months of operation. After this initial period, the Loop must be able to run in a sustainable fashion. The initial application for funding from the Community Partnerships Fund (Wellington City Council, 2007) provides a Sustainability plan that says that the Loop will be sustainable by offering increased value in terms of delivering more learning opportunities for schools while reducing overall costs through shared resourcing.

A key theme that recurs in discussions with Loop members is that the cost of participating in the Loop must be the same or less than the current costs the schools face to provide the proposed applications and internet access. Each school has implemented these differently to date and so the costs to each school are likely to be different. The Loop will need to persuade the initial members, and potential new members, that the charging is equitable by being transparent about its costs. The Loop will need to convince the schools that the Loop cannot be charged for on a strictly cost recovery basis as there is a need to continually re-invest in maintaining and improving the infrastructure and technology, as well as to provide the school staff with appropriate training and support in order to maximize the benefits the Loop can deliver.

Although the Loop trust deed explicitly states that the Loop exists to offer services via a fibre network, there are already some schools who wish to join the Loop and who do not have access to Citylink. These schools would be interested to join in a lower speed capacity ( eg Onslow College in Johnsonville).



The Loop's other purposes include :

- “4.2 developing, supporting and promoting a range of collaborative learning and community applications involving the use of the Wellington Loop;
- 4.3 identifying opportunities for reducing information and communications technology support costs for schools in the Greater Wellington Region;” (Chapman Tripp, 2007, page 4).

The Loop could therefore choose to offer two product bundles to accommodate any interested schools:

1. High speed access – for schools that can connect to the Loop via fibre and can achieve the high speed standard required for access to KAREN, the bundle would include:
  - (a) Access to Citylink fibre (this component is optional, if the school can achieve the same access speeds with another provider they may choose to do so),
  - (b) All applications provided by the Loop infrastructure,
  - (c) Access to the commodity internet,
  - (d) Access to KAREN.
2. Low speed access – for those schools who either cannot afford to access the Loop via fibre, or are unable to because the infrastructure to do so is not available in their location. This bundle would include c) above plus a subset of b) which would exclude those applications requiring high speed access, such as video conferencing.

This pricing strategy may be attractive to schools who believe that it is only a matter of time before they do have fibre available in their location and expect to upgrade to the high speed offering as soon this does happen. These schools may also perceive that there is additional value for them in the reduced costs and increased collaboration offered through the Loop's low speed product when compared with their current situation.

This strategy may also be attractive to primary schools who typically have more limited funding and who might not be able to afford to connect to the fibre infrastructure even if it is available to them.

By adopting a price strategy based on the two bundles, the Loop will have a greater number of participants than would be possible with a one-price strategy and will therefore have more revenue generated. This will allow the Loop to reduce the costs to all participants.

Some of the initial member schools have already invested individually in some of the tools the Loop proposes to introduce. For example Wellington Girls College has a learning management system that is significantly integrated within the teaching practices of the school. The Loop will need to consider whether schools with existing investments will be reluctant to pay for a bundle where some of the components duplicate an existing application. For simplicity of administration, and hence reduced cost of administration, it would be preferable to offer the two bundles described above on a fixed price per student per year and allow the schools to choose which of the applications they wish to make use of. Dissent could be minimized by making the bundle price lower than the sum of the individual component prices.

Schools are very concerned with equity of access for disadvantaged members of their community and some teachers have expressed an interest in seeing schools with less resources (i.e. primary schools and lower decile schools) subsidized to participate in the Loop. The two bundles described do offer a potential solution for those schools who cannot afford to connect to the fibre infrastructure, though the low cost bundle does restrict the range of applications available. If there is a desire to assist these schools to gain access to the high speed option, the cost of the initial connection to the fibre infrastructure is the biggest barrier to participating. Currently, this cost is borne by each school and is external to the costs of the Loop – including this cost into the Loop's costing could distort the prices the Loop can charge and therefore might prove counter-productive as it will disadvantage all member schools. It may be more equitable for individual schools to apply to government or charitable agencies for funding through grants to establish the connection to the fibre infrastructure.

As schools will always have limitations in their funding, the Loop may need to consider a coordinated approach to seeking external funding to subsidise the Loop's operations and thereby reduce the cost to the participating schools. This might take the form of grants, sponsorship, or specific funding from the Ministry of Education

## CONCLUSION

The Wellington Loop offers access to physical infrastructure to provide information goods to its members. The full provision of the information goods is dependent on at least part of the Loop's privately owned infrastructure.

The Loop is a consortium of schools who have come together to reduce their technology costs through co-operation. But this is seen as the mechanism to provide the schools with greater access to technology and the ability to collaborate with each other and the wider inter-connected education community.

The Loop can be viewed as a two-sided market where more schools will be attracted to join the Loop as more students and teachers incorporate the tools into their learning and teaching practices.

The Loop can look to maximize its revenue by offering two distinct product bundles which enables it to attract a larger group of schools, and hence generate larger revenues, than if it is constrained by the limitations of access to high speed fibre networks in general and to Citylink in particular. If some schools find the low cost bundle meets their need within their funding or location constraints, the overall number of members of the Loop is increased and this increases the opportunities for collaboration and cost sharing.

The two product bundles provide the loop with a simple price model for administration. However, care needs to be taken to ensure that the Loop's costs are transparent to its members so that the charging model is not challenged. As the Loop is owned by a co-operative trust, any surplus revenues will be redistributed to the member schools through lower prices or through re-investment in new technology and services.

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